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WEB UNWINDING APPARATUS

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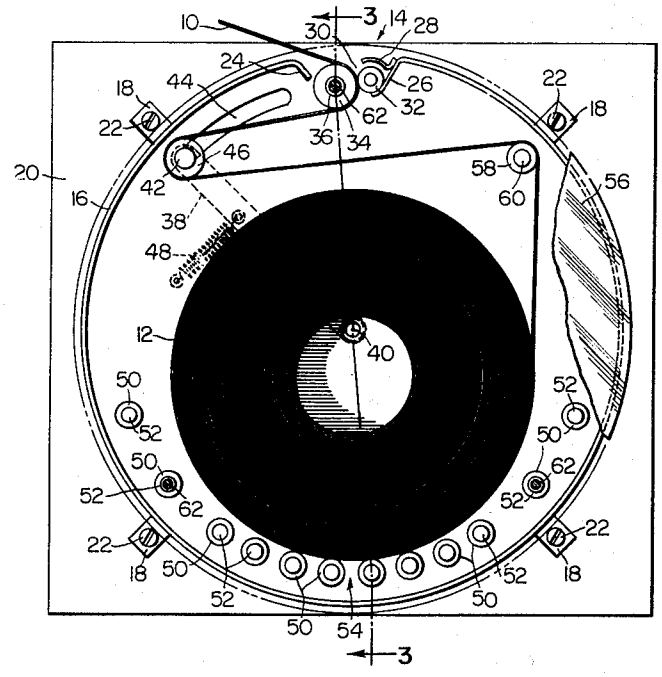


Fig.1

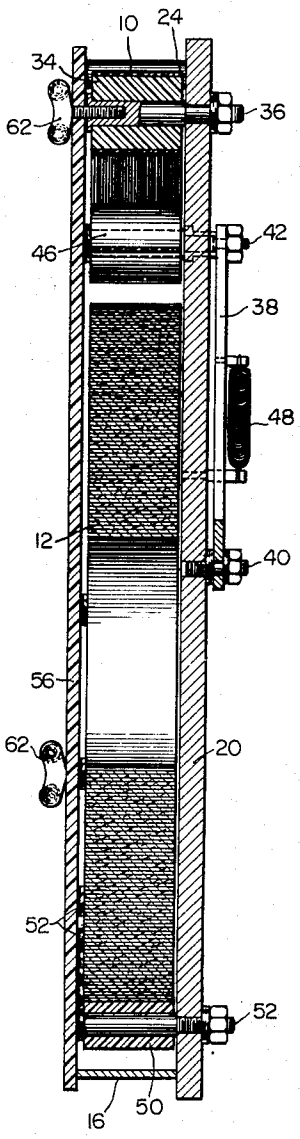


Fig.3

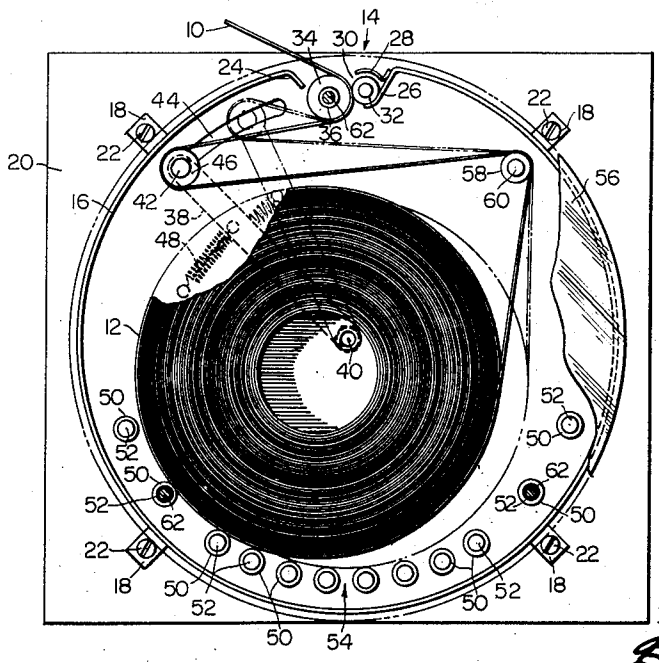


Fig.2

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WEB UNWINDING APPARATUS

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2 Claims. (Cl. 242—68.7)

This invention relates generally to improvements in feeding devices and particularly to apparatus for regulating the unwinding of strand or web material from a supply roll.

While not limited thereto, the invention finds special application in feeding relatively narrow web material, such as paper tape, to a processng unit where the web is impressed with data indicia or, if previously impressed therewith, to a sensing unit for reading the data representations thereon. Such processing and sensing units are frequently operated at high speeds and heretofore have required critical design considerations in web feeding apparatus to prevent undue strains in the processing units and also in the web material.

Web feeding apparatus falls generally into two categories, web tension feed and servo-motor feed. Each of these systems has certain advantages and disadvantages. The web tension feeding systems are generally inexpensive to manufacture but are not fully responsive to variations in acceleration by reason of their use of sensitive braking arrangements. The brakes are generally constructed to suit average conditions so that they do not compensate for the decrease in diameter and weight of the web supply roll as the web is removed therefrom with the result that there is excessive slack in the web and over-running of the supply roll. On the other hand, the servo-motor web feed systems are quite flexible in controlling the accleration of the supply roll, but such systems are expensive to manufacture.

The principal object of the present invention is to provide a novel, low-cost web feeding apparatus quickly responsive to variations in acceleration.

Another object of the invention is to provide a web feeding apparatus capable of controlling the acceleration of a web supply roll without the aid of auxiliary braking devices.

A further object of the invention is to provide a web feeding apparatus which eliminates the need for web supply roll mounting reels or other mounting devices.

Another object of the invention is to provide a web feeding apparatus of simple construction and which can be loaded for operation in a very simple manner.

The invention may be described broadly as including means defining upwardly inclined pathways for supporting a web supply roll on its periphery. The starting end of a web is led to a web processing unit over suitable guide means which includes an oscillatable member responsive to initial feeding shocks and variations in acceleration caused by the feeding force of the processing unit. In recovering from the initial shocks of feeding movements, the oscillatable member retracts toward its normal or rest position and, in so doing, causes a length of the web to be drawn from the supply roll. This drawing motion imparts to the supply roll a momentum, and causes it to roll upwardly on the inclined pathway. From its upward position the

supply roll rolls down the incline and, in so doing, rewinds upon itself some or all of the excess slack in the web which may be present, the amount of rewind depending on such factors as speed, impact and weight of the supply roll. Means are also provided, which are operative during non-feeding intervals of the processing unit, to prevent feeding back into the apparatus of the invention any of the web external thereto.

The invention will best be understood from the following detailed description of a preferred embodiment thereof when read in conjunction with the accompanying drawings, in which:

Fig. 1 is a front elevation of one form of apparatus constructed in accordance with the present invention with the cover plate partially broken away;

Fig. 2 shows the same apparatus as in Fig. 1 but illustrating an operative condition; and

Fig. 3 is a vertical sectional view, on an enlarged scale, taken on line 3—3 of Fig. 1 and with the cover plate shown.

Referring to the drawings illustrating a preferred embodiment of the invention, a narrow web or tape **10** (Fig. 1) is adapted to be fed or unwound from a roll of tape **12** in response to the feeding movements of a tape processing unit, not shown. The tape is led to the processing unit through a discharge opening **14** in a cylindrical casing **16**. The casing **16** is made preferably of sheet material and is formed with flanged portions **18** for securing the casing to a support or mounting plate **20** by means of screws **22**. The ends of the sheet material forming casing **16** are bent downwardly angularly as at **24** and **26** to form the discharge opening **14**. Soldered or otherwise secured to casing **16** at the discharge opening **14** is an arcuate roof member **28** which together with casing end **26** form a partial enclosure **30** for confining a gravity responsive friction roller **32** to its area of operation.

Adjacent to the discharge opening **14** is a tape guide roller **34** mounted for rotation on a stud shaft **36** secured to plate **20**. Roller **34** cooperates with roller **32** to prevent feed-back of tape **10** in a manner which will be described hereinafter.

One end of an arm **38** is pivotally mounted on the rear face of plate **20** (Fig. 3) on a stud shaft **40** secured to plate **20**, and its other end carries a stud shaft **42** secured thereto and extending through an arcuate opening **44** (Fig. 1) in plate **20** for free movement therealong, and to the front of plate **20** for rotatably mounting thereon a tape guide roller **46** A helical spring **48**, having one of its ends secured to arm **38** and the other of its ends secured to plate **20**, biases arm **38** to a normal or rest position at the leftward limit of arcuate opening **44** as seen in Fig. 1. A series of rollers **50** are rotatably mounted on stud shafts **52** secured to plate **20** and are arranged in spaced relation to form an arcuate pathway defining oppositely extending leftward and rightward curved inclines with respect to the low point **54** of the arc. A removable cover plate **56**, preferably of transparent material, is used to enclose the apparatus and may be secured thereto by means of winged screws **62** engaging tapped holes in stud shafts **52** and **36** or in any other suitable manner.

Preparatory to operation, the apparatus is loaded with tape in a very simple manner. A roll of tape **12** is placed on rollers **50** (Fig. 1) and in this preferred embodiment is supported at its periphery. It will be noted at this point that no mounting reel is required and that roll **12** is free to be rolled over rollers **50** on its periphery. The leading end of the tape is passed over a guide roller **58** rotatably mounted on a stud shaft **60** secured to plate **20**, and then passed around guide rollers **46** and **34** and through discharge opening **14** to

the processing unit. As shown in Fig. 1, the apparatus is in a normal or rest position and prepared for operation.

In operation, the tape is drawn from the discharge opening 14 by the processing unit and the unequal tension created in the tape by the initial shocks of feeding is taken up by arm 38. Thus in response to the initial feeding shock arm 38 yields to the pull of the tape against the biasing action of spring 48 causing it to rock clockwise on stud shaft 40 to an advanced position as is shown in phantom in Fig. 2. In recovering from these initial shocks, spring 48 retracts arm 38 counterclockwise toward its rest position and, in so doing, causes arm 38 to draw a length of tape from the tape roll. This drawing motion imparts to the tape roll a momentum and by reason of its kinetic energy the roll turns counterclockwise and rolls up the leftward curved incline on rollers 50 to a position such as shown in Fig. 2. When in its upper position, the tape roll possesses potential energy and therefore, after the initial feeding shock is dissipated, rolls down the incline in a clockwise direction, thereby rewinding upon itself some or all of the slack in the tape caused by the initial feeding shock.

Feed-back of the tape is prevented by a wedging action of roller 32. This roller is lying on the upper surface of the angularly depending casing end 26 and tends to wedge itself between the casing end and guide roller 34. When tape is being withdrawn, it turns roller 32 clockwise and rolls it upwardly out of wedging position, but when feeding stops, as in intermittent feeding, roller 32 rolls downward and wedges the tape to prevent feed-back into the apparatus.

From the foregoing description it will be apparent that the invention provides a novel means for unwinding web material from a supply roll. No mounting reels are required and loading is performed in a minimum of time. If it is desired to withdraw the web with its inner side facing upward, opposite to that shown in the drawings, this may be accomplished simply by reversing the supply roll, in which event its rolling movements will be on the rightward incline of rollers 50.

The apparatus of the invention is self-regulatory in the sense that the greater the intermittent tension in the web the greater the transformed potential energy. Consequently the web supply roll is responsive to a wide range of accelerations, and strains and tensions on the processing unit and web material are therefore minimized. Tensions on the processing unit are also eliminated by the anti-feedback arrangement.

The invention has been described with reference to a specific form thereof, but it is to be understood that this is a preferred embodiment, and that various changes in size, shape and arrangement of parts may be resorted to without departing from the spirit of the invention, or the scope of the subjoined claims.

While the invention contemplates the elimination of web supply roll mounting reels or other mounting devices, it also contemplates the possibility that it may be desirable in some applications to place the supply roll on a mounting reel and have the reel roll up and down the incline on its peripheral edges in the same manner as the illustrated supply roll.

What is claimed is:

1. Apparatus for unwinding tape material and the like from a supply roll comprising, a vertically positioned supporting member having a horizontal axis normal to said member and an arcuate slot extending therethrough concentric with said axis, said member having front and rear faces, a vertically positioned casing secured to the front face of said supporting member and having a taped discharge opening therein, a first tape guide roller mounted on the front face of said supporting member adjacent to said discharge opening, an angularly depending member adjacent to said first tape guide roller, a friction roller lying on said angularly depending member and being urged by gravity into contact with said first tape guide roller, means for confining the movement of said friction roller to an area between said angularly depending member and said first tape guide roller, an elongated arm pivotally mounted at one end on said axis and to the rear face of said supporting member, a shaft secured to the other end of said arm and extending through said arcuate slot into said casing, a second tape guide roller mounted on the extended portion of said shaft within said casing, said arm being movable about said axis to move said second tape guide roller toward and away from said first tape guide roller, a spring biasing said arm to a rest position wherein said second tape guide roller is away from said first tape guide roller, a plurality of spaced rollers within the casing mounted on and having their axes normal to the front face of said supporting member and defining a supporting means for said supply roll including an incline for bodily movement of said supply roll therealong, and a cover member substantially enclosing said casing, said supply roll having an unwound portion of tape passed about said first and second tape guide rollers and extending out of said apparatus through said discharge opening between said first tape guide roller and said friction roller.

2. Apparatus for unwinding tape material and the like from a supply roll comprising, a vertically positioned supporting member having a horizontal axis normal to said member and an arcuate slot extending therethrough concentric with said axis, said member having front and rear faces, a vertically positioned casing secured to the front face of said supporting member and having a tape discharge opening therein at its upper region, an angularly depending member extending into said discharge opening, a first tape guide roller mounted on the front face of said supporting member adjacent to said angularly depending member, a friction roller lying on said angularly depending member and being urged by gravity into contact with said first tape guide roller, means for confining the movement of said friction roller to an area between said angularly depending member and said first tape guide roller, an elongated arm pivotally mounted at one end on said axis and to the rear face of said supporting member, a shaft secured to the other end of said arm and extending through said arcuate slot into said casing, a second tape guide roller mounted on the extended portion of said shaft within said casing, said arm being movable about said axis to move said second tape guide roller toward and away from said first tape guide roller, a spring adjacent to the rear face of said supporting member and biasing said arm to a rest position wherein said second tape guide roller is away from said first tape guide roller, a third tape guide roller mounted on the front face of said supporting member and within said casing, a plurality of spaced rollers mounted on and having their axes normal to the front face of said supporting member and being within said casing adjacent to its lower portion, said spaced rollers defining oppositely extending inclines for supporting said supply roll for bodily movement therealong, said supply roll having an unwound portion of tape passed about said tape guide rollers in successive substantially opposite directions and extending out of said apparatus through said discharge opening between said first tape guide roller and said friction roller, and a cover member substantially enclosing said casing, and wherein feeding of tape out of said discharge opening rolls said friction roller upwardly on said angularly depending member and moves said arm away from said rest position and toward said first tape guide roller and against the biasing action of said spring to release a portion of tape through said discharge opening, and wherein the return of said arm to said rest position by said spring unwinds an additional portion of tape from said supply roll and rolls the latter upwardly on one of said inclines, and wherein

cessation of such feeding permits said friction roller to wedge itself against the tape and said first tape guide roller thus to lock the tape against feedback into the apparatus and allows said supply roll to move downwardly on said one of said inclines to rewind upon itself slack in said tape.

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